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THE POTENTIAL OF *Clathria reinwardtii* as BIOACCUMULATOR OF HEAVY METAL Cu

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ABSTRACT

Heavy metal Cu is an essential metal required by living organisms but a pollutant in water environment when existed in a level above the treshold level. The capability of sponge *Clathria reinwardtii* in accumulating heavy metals was analyzed according to modified Müller et al. (1998) method, and the sediment was analyzed according to Loring and Rantala in Rochyatun et al., (2006). Cu concentrations were measured by ICP-OES. The results indicate that *Clathria reinwardtii* was capable of accumulating the highest Cu level compared to other sponges. The highest Cu level analyzed in *Clathria reinwardtii* was 161.3 mg/kg.

INTRODUCTION

Heavy metals in water environment can be derived from nature and anthropogenic due to human activities in land or sea. Anthropogenic heavy metal concentration in the environment increases with the industrial development widespread.

Heavy metal contamination in Spermonde Archipelago waters endangers the organisms life which impacts to human life indirectly. The main characteristic of a heavy metal is difficult to degrade, that it can accumulates easily in water environment and organisms including sponges and sediment [1].

Sponges as filter feeders can be exposed to heavy metals due to their eating pattern that filtering seawater through pores in their body surface and live in coral reef ecosystem. In contrast to other seasonal macro-invertebrates, sponges are long-lived species and not highly affected by seasonal environmental changes. Heavy metal Cu is an essential metal that is physiologically needed by sponge to catalyze chemical reactions that make possible the production of new metabolites. This essential metal in living organism generally works at enzymes [2].

RESULTS AND DISCUSSION

Physicochemical parameters have met the requirements for sponge growth. Optimal temperature for sponge growth is 25-29^{o}C. The salinities of the three islands also met the requirements of sponge growth (29-36 $^{o}/_{oo}$). The environmental pH of the waters has also met the sponge growth requirements (about 6-8) [5].

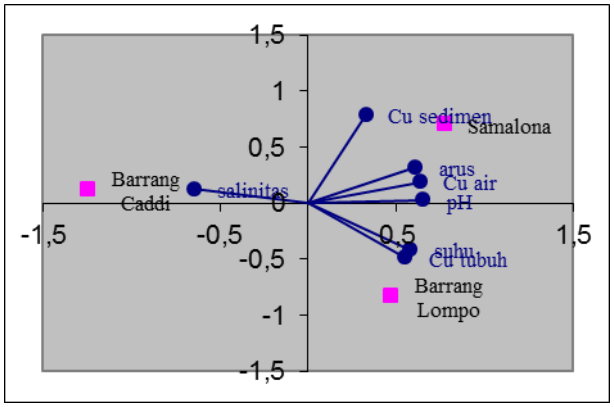

Figure 1. The sampling locations

Figure 2. Cu concentration in 3 islands

Analysis of essential metal in sponge by ICP-OES Analysis results of essential metal Cu by ICP-OES can be seen from Figure 2.

Analysis results indicate that essential metal Cu has the highest concentration in *Clathria sp* from Barrang Lompo island. One-way ANOVA test indicated Cu concentration difference between the three islands ($p<0.05$). Barrang Lompo is the most populated island compared to other two islands, whereas the Samalona is the nearest island from Makassar city. This factor is one of the causes of the high Cy level in Sponge from Spermonde archipelago. Cu metal can naturally get into waters body through metal particle complexion in the air due to rain and mineral rock erosion event around the waters body. Cu from human activities are derived from electric industrial waste and shipyard [6]. Makassar city has shipyard industry that contribute significantly to Cu level in waters.

Relationship between Cu concentration of *Clathria reinwardtii* and environmental parameters

Cu concentration in Clathria reinwardtii is influenced by seawater CU concentration, sediment Cu concentration, flow rate, temperature, pH, and seawater salinity.

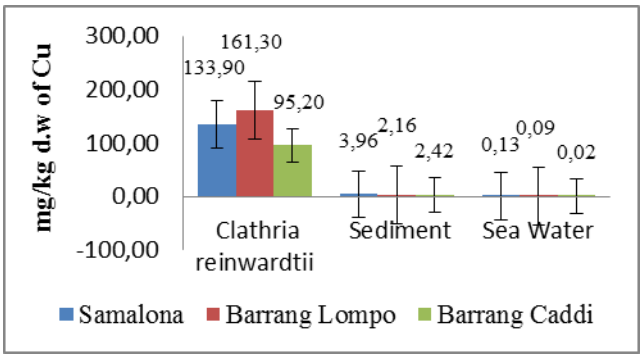

Figure 3. Relationship between Heavy Metal Cu of *Clathria reinwardtii* with environmental parameters, sediment and seawater

PCA analysis in this study produced 1 axis that could explain 79.7% of variations occured. Samalona location was characterized by sediment Cu, seawater Cu, and high current flow. Barrang Lompo was characterized by high *Clathria reinwardtii* Cu and temperature.

Normal Cu level in seawater ranged from 0.002 to 0.005 ppm [6]. The threshold level established by KMNLH [7] for marine biota need is 0.008 ppm. Therefore, referring to threshold value of [8], the seawater of the three islands have been polluted by heavy metal Cu.

According to Reseau National d'Observation [8] normal Cu level in uncontaminated sediment is 5 ppm. Therefore, referring to [8], it can be said that sediment quality in this waters have not contaminated by Cu. Cu level in the sediment was also higher compared to seawater, indicating the presence of Cu accumulation in sediment.

Waters biota are highly sensitive to high Cu concentration in waters body from which they live. The crustacean family will subject t death within 96 hours when Cu concentration is in the range of 0.17 to 100 ppm. In the same time range, the biota of mollusk family will subject to death when the soluble Cu level soluble in seawaters body in which the biota live ranges from 0.16 to 0.5 ppm, and Cu concentration of 2.5-3.0 ppm in waters body had been found to kill fish [9]. High Cu concentration in *Clathria reinwardtii* in Samalona, Barrang Lompo, and Barrang Caddi islands was in the range of 95.20 – 161.30 mg/kg, indicating sponge ability in accumulating heavy metal Cy without resulting in death to the sponge.

CONCLUSION

Sponge *Clathria reinwardtii* has the potential as heavy metal Cu bioaccumulator in contaminated seawater environment due to its ability in accumulating heavy metal Cu in the range of 95.20-161.30 mg/kg dry weight..

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